

(12) UK Patent Application (19) GB (11) 2 057 763 A

(21) Application No 8028668

(22) Date of filing
5 Sep 1980

(30) Priority data

(31) 2936204

2942693

(32) 7 Sep 1979

23 Oct 1979

(33) Fed Rep of Germany

(DE)

(43) Application published

1 Apr 1981

(51) INT CL³ H01L 23/36

(52) Domestic classification

H1K 1BC 5D9 5E8 PAB

PDX

(56) Documents cited

GB 1502428

GB 1450922

GB 1204732

(58) Field of search

H1K

(71) Applicant

Robert Bosch GmbH

Postfach 50

7000 Stuttgart 1

Federal Republic of

Germany

(72) Inventor

Peter Lack

(74) Agents

Messrs W P Thompson

& Co

Coopers Building

Church Street

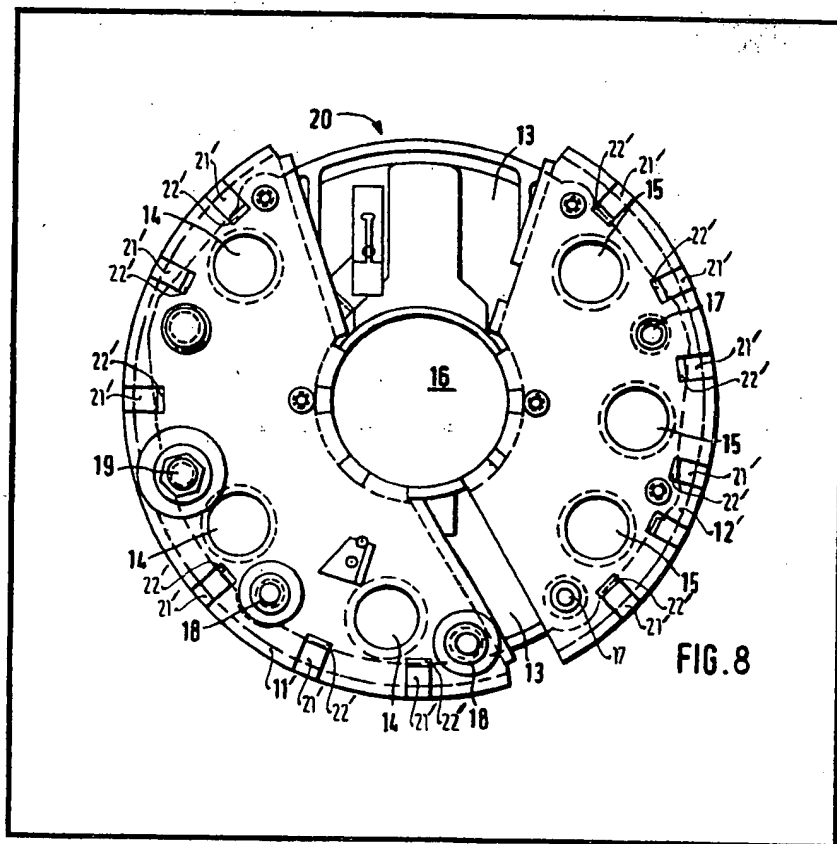
Liverpool

L1 3AB

(54) Rectifier assembly

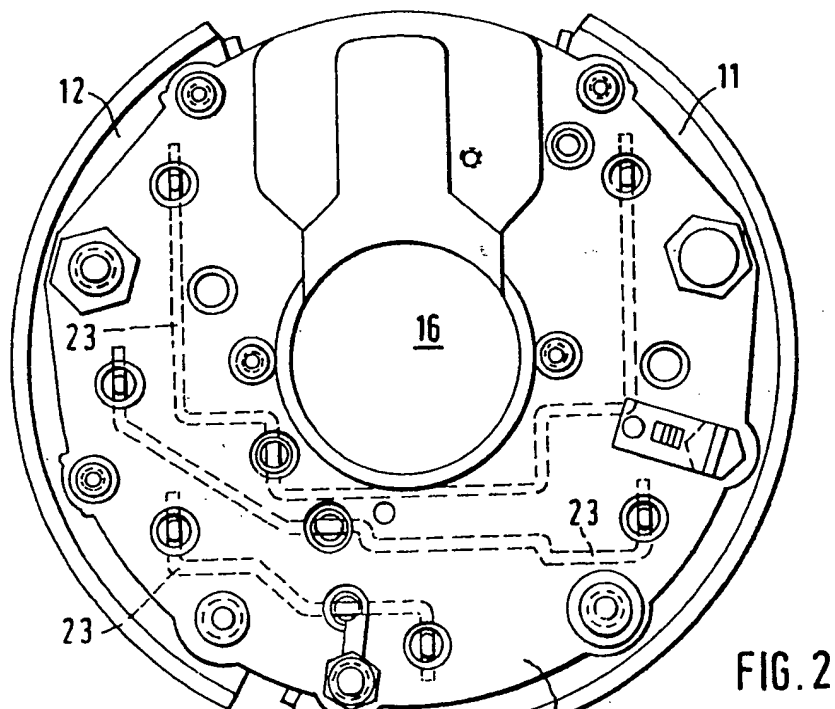
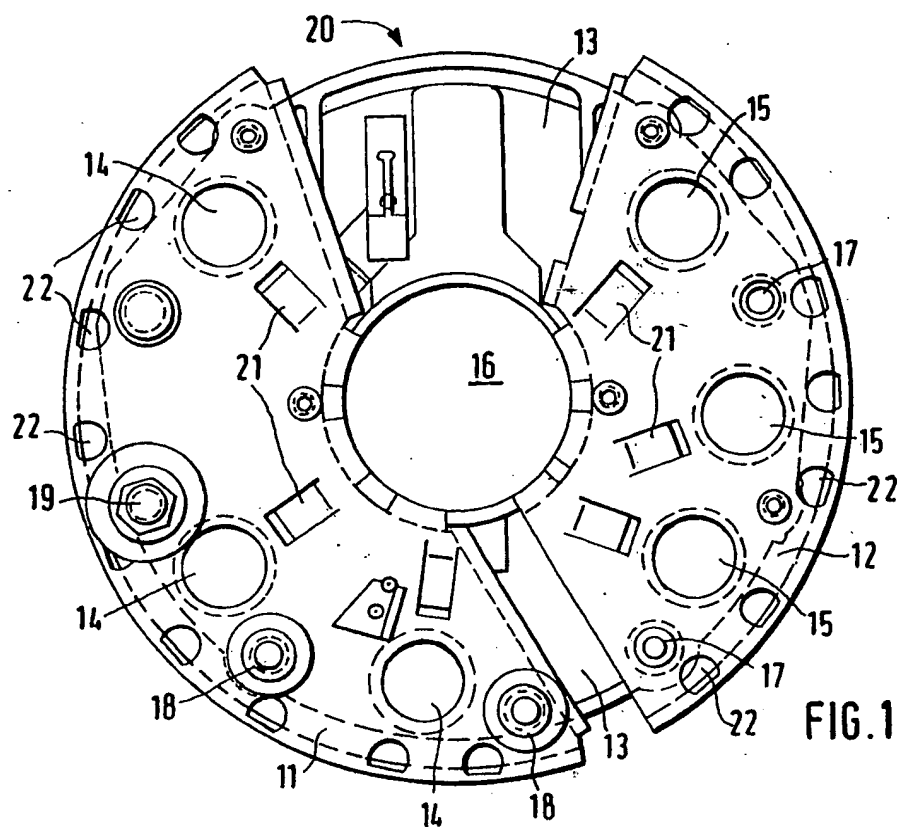
heat sinks.

(57) A rectifier assembly for installing generators is of asymmetrical construction, that is to say, a second heat sink (12') directly connected to the generator housing, which thereby acts as a supplementary heat sink, is smaller than the first heat sink (11') which is insulated from the generator housing. A rectifier assembly of this kind having diodes (14, 15) on the heat sinks is particularly suitable for installation in three-phase generators for motor vehicles. Angled tabs (21') are stamped from rim portions of the heat sinks and from apertures (22') in an arcuate transition between the body of the heat sink and an axially directed extension. The tabs and the apertures promote the flow of the generator cooling air over the diodes (14, 15) and the



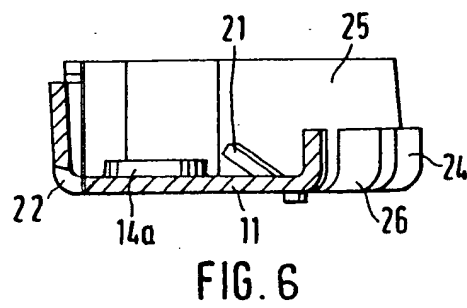
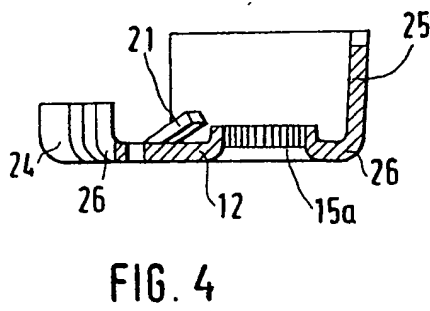
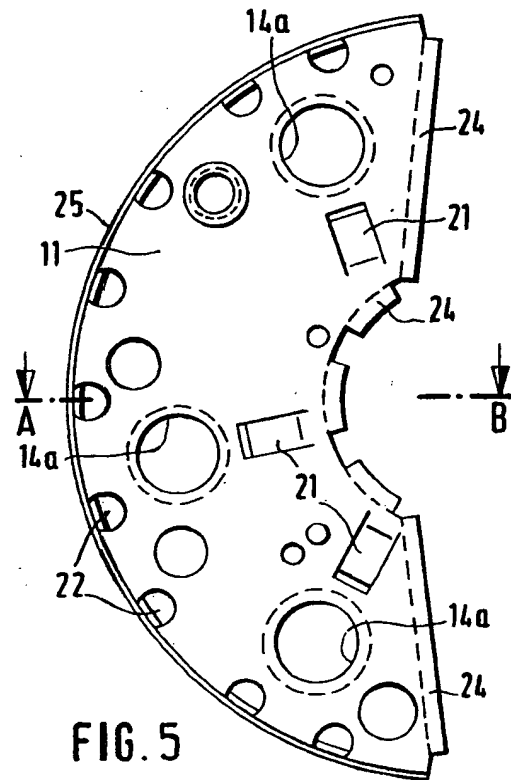
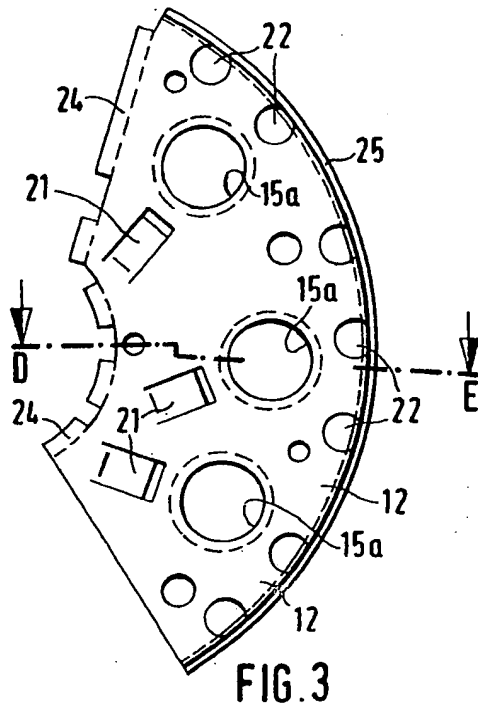
GB 2 057 763 A

1/5



2057763

2/5.



2057763

3/5

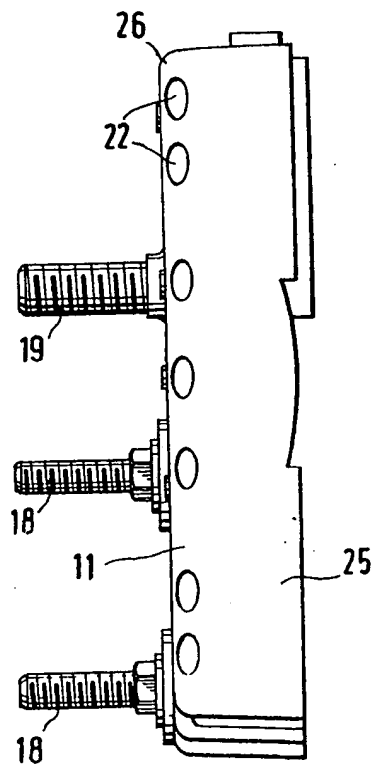
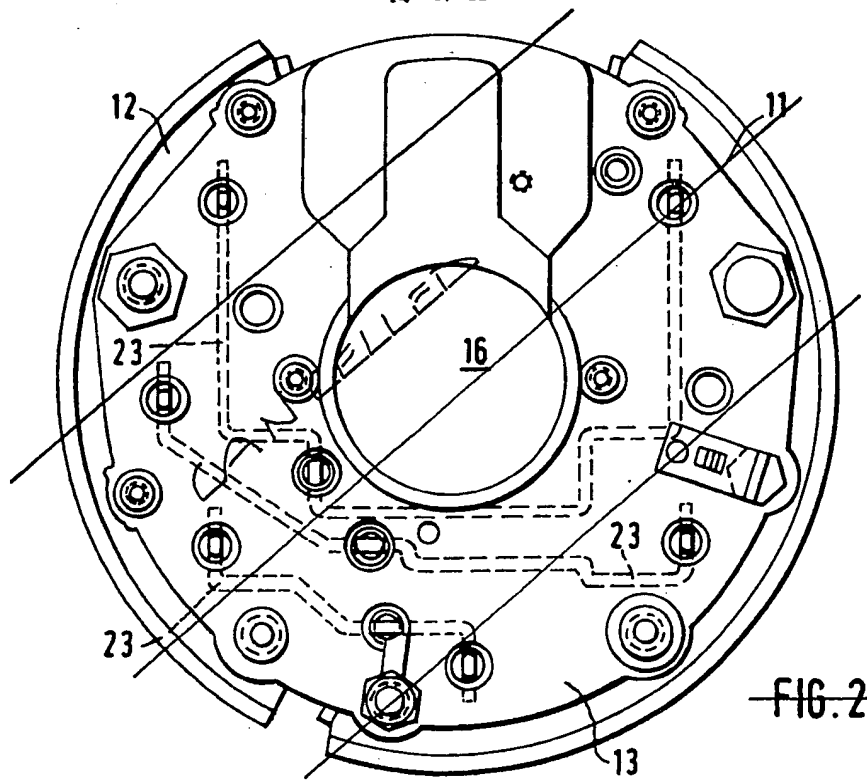
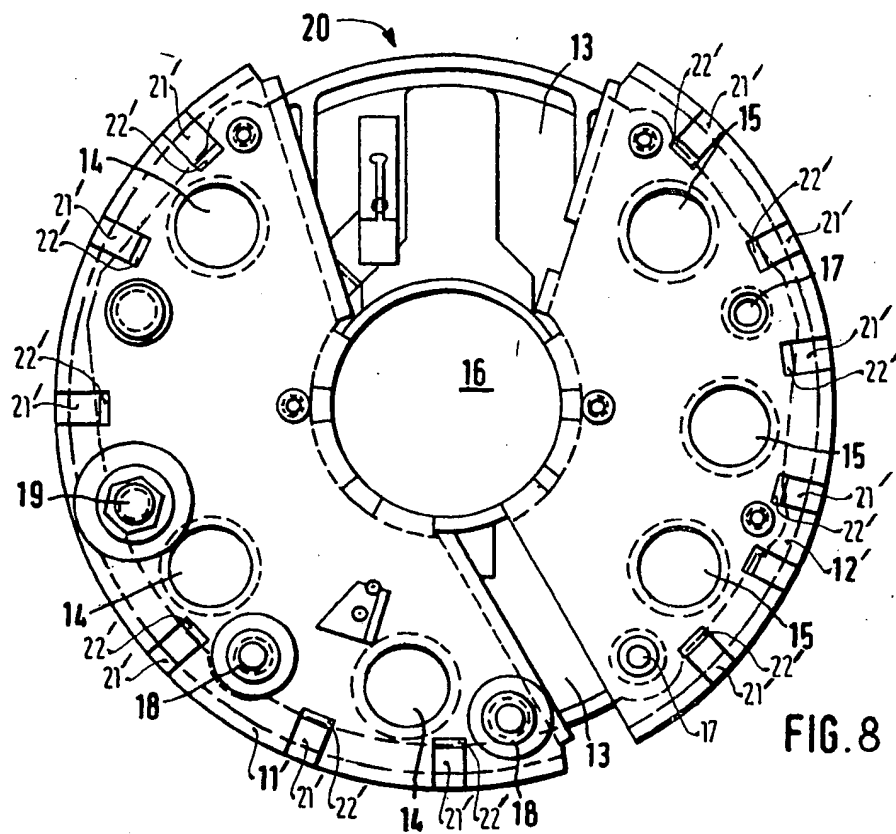


FIG. 7

4/5.



2057763

5/5.

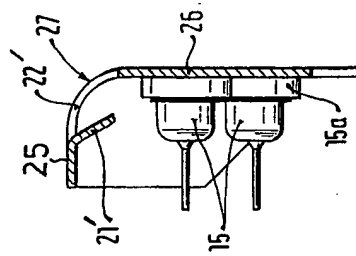


FIG. 10

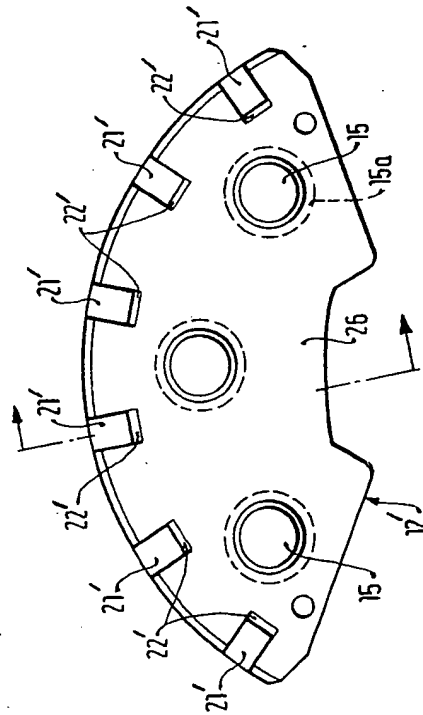


FIG. 9

SPECIFICATION

Rectifier assembly

- 5 The invention relates to a rectifier assembly having diodes arranged on positive and negative heat sinks.

- German Patent No. 19 43 333 describes a rectifier assembly for a three phase generator.
- 10 The assembly comprises two heat sinks of substantially equal size. The heat sinks are disposed in a plane at right angles to the generator shaft, and the electrical connections of the free electrode terminals of the diodes
- 15 on the heat sinks are connected by way of conductors which are injection-moulded in an insulating plate. This known rectifier assembly is adequate for generators for motor vehicles. Similar rectifier assemblies are used for commercial vehicles although, owing to the higher
- 20 generator output required, each heat sink includes a plurality of parallel-connected rectifier diodes per phase. In order to be able to dissipate the heat due to power loss occurring in the rectifier diodes, one also frequently
- 25 uses a three heat sink system, the heat sinks being in this case electrically connected to the phase windings of the generator.

- In order to prevent the admissible crystal
- 30 temperature from being exceeded in the diodes, the heat sinks used must be of a minimum size. In the case of a parallel combination of diodes, special care must be taken to ensure that the parallel-connected diodes
- 35 have the same crystal temperature, since, with differing crystal temperatures, one of the two diodes can be destroyed as a result of overload, and the other diode is then also necessarily destroyed. In the case of a heat sink
- 40 which is secured directly to the generator housing, a large proportion of the heat is dissipated by heat transfer to the generator housing. This heat sink is thereby cooled to a greater extent than the other heat sink which
- 45 is cooled only by thermal radiation and convection to the stream of cooling air.

- All these structural conditions and problems to be taken into account hitherto meant that relatively large rectifier assemblies had to be
- 50 used.

- The present invention provides a rectifier assembly for installation in a generator, which assembly has an opening through which the generator shaft passes and comprises a first
- 55 heat sink with one set of diodes thereon and a second heat sink with another set of diodes thereon, the second heat sink being in thermal contact with a supplementary heat sink, and having a smaller cooling surface than the
- 60 first heat sink.

- This has the advantage that all the power diodes have substantially the same crystal temperature and that, moreover, the crystal temperature can be perceptibly decreased.

- 65 Furthermore, the rectifier assembly can be of

smaller construction for a given output. A substantial saving of costs is possible.

- A special advantage with respect to assembly and costs is that fewer power diodes may
- 70 be needed. A further improvement in the cooling of the insides of the heat sinks and of the ends of the coil of the generator can be achieved by individual measures such as the stamping-out of tabs from the heat sinks and
- 75 the provision of apertures in the heat sinks.

The invention is further described, by way of example, with reference to the drawings, in which:—

- Figure 1* shows a rectifier assembly viewed
- 80 from the heat sink side,

Figure 2 shows the rectifier assembly viewed from the insulating plate side,

- Figure 3* is a view of the smaller of the two heat sinks, before the rectifying diodes have
- 85 been fitted,

Figure 4 is a section on the line D—E of *Fig. 3*,

Figure 5 is a view of the larger of the two heat sinks,

- 90 *Figure 6* is a section on the line A—B of *Fig. 5*,

Figure 7 is a side elevation of the larger heat sink of *Figs. 5* and *6*, and

- Figures 8, 9 and 10* are views, similar to
- 95 *Figs. 1, 3 and 4* but showing another embodiment of rectifier assembly.

- Figs. 1* and *2* show a full-wave rectifier assembly for a three-phase generator for a motor vehicle. The rectifier assembly has a positive heat sink 11 serving as a first heat sink, and a negative heat sink 12 serving as a second heat sink. The two heat sinks 11, 12 are of substantially sectorial construction but are asymmetrical in that the heat sink 11 is larger than the heat sink 12. Conductors 13
- 100 (*Fig. 2*) are let into an insulating plate 13 which will be seen in *Fig. 1* behind the heat sinks 11, 12. "Positive" diodes 14 are fitted in the first heat sink and are electrically connected thereto by their cathodes, and "negative" diodes 15 are fitted in the second heat sink 12 and are electrically connected thereto by their anodes. An opening 16 through which the generator shaft passes is provided
- 105 in the centre of the overall rectifier assembly 11, 12, 13 at right angles to the surfaces of the heat sinks 11, 12. The negative heat sink 12 has screw connections 17 for securing the smaller heat sink 12 directly to the generator housing (not visible in the drawing) so that the generator housing acts as a supplemental heat sink for the negative diodes. The larger positive heat sink 11 carries connection pins 18 for the connection of positive leads and a
- 120 further, insulated, screw bolt 19 for further securing the rectifier assembly to the generator housing. The heat sinks 11, 12 are made from sheet metal, and angled tabs 21 are stamped out of the heat sinks between the
- 125 diodes 14, 15 and the opening 16. Further-
- 130

13. A rectifier assembly as claimed in any preceding claim, in which the first and second heat sinks are made from sheet metal.
14. A rectifier assembly as claimed in
5 claim 13, in which at least one portion of the rims of the first and second heat sinks is provided with collar-like bent-up portions.
15. A rectifier assembly as claimed in
10 claim 14, in which the inside of the transition from the portion of each of the heat sinks which is at right angles to the generator shaft to the collar-like bent-up portion which is remote from the opening for the generator shaft, is circularly arcuate.
16. A rectifier assembly as claimed in
15 claim 15, in which apertures are formed in the arcuate transition.
17. A rectifier assembly as claimed in
20 claim 16, in which the apertures are located in the centre of the arcuate transition.
18. A rectifier assembly as claimed in any preceding claim, in which angled tabs are stamped out of the first and second heat sinks.
19. A rectifier assembly as claimed in
25 claim 18, in which a stamped out tab is provided for each of the diodes.
20. A rectifier assembly as claimed in
30 claim 18 or 19, in which the stamped out tabs are disposed between the diodes and the opening provided for the generator shaft.
21. A rectifier assembly as claimed in
35 claim 18, 19 or 20, in which the stamped out tabs are directed towards the associated diodes.
22. A rectifier assembly as claimed in any of claims 18 to 21, when dependent from any of claims 14 to 17, in which the angled tabs extend in the same direction as the collar-like bent-up portions.
23. A rectifier assembly as claimed in
40 claim 18, when appendent to claim 16, in which the apertures are formed by the stamping out of the tabs.
24. A rectifier assembly for installation in a generator, having at least one heat sink for the rectifier diodes, which heat sink is made chiefly from sheet metal and is bent up at a rim, and having an opening through which
50 the generator shaft passes, tabs being bent out of the rim of the heat sink.
25. A rectifier assembly as claimed in claim 24, in which the inside of the transition from the portion of the heat sink which is at right angles to the generator shaft to the rim which is remote from the opening for the generator shaft, is circularly arcuate.
26. A rectifier assembly as claimed in
55 claim 25, in which apertures are provided in the arcuate transition.
27. A rectifier assembly as claimed in claim 26, in which the apertures are located in the centre of the arcuate transition.
28. A rectifier assembly as claimed in
65 claim 26 or 27, in which the tabs are disposed at the boundary of the apertures.
29. A rectifier assembly as claimed in claim 28, in which the tabs are produced by incomplete stamping-out of the apertures.
30. A rectifier assembly as claimed in any
70 of claims 23 to 29, in which at least one tab is provided for each of the diodes.
31. A rectifier assembly as claimed in any of claims 23 to 29, in which the tabs are
75 disposed between the diodes.
32. A rectifier assembly as claimed in any of claims 23 to 31, in which the tabs extend towards the spaces between the associated diodes.
33. A rectifier assembly constructed substantially as herein described with reference to and as illustrated in the drawings.

Printed for Her Majesty's Stationery Office
by Burgess & Son (Abingdon) Ltd.—1981.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.